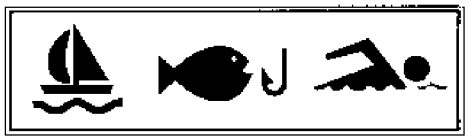
THE ROUGE RIVER PROJECT
A WORLD CLASS EFFORT



BRINGING OUR RIVER BACK TO LIFE

Rouge River National Wet Weather Demonstration Project

Wayne County, Michigan

CSO BASIN EVALUATION PLANS DATA COLLECTION AND TRANSFER GUIDE RPO-NPS-TM33.00

August 1999

Rouge River National Wet Weather Demonstration Project

Wayne County, Michigan

CSO BASIN EVALUATION PLANS DATA COLLECTION AND TRANSFER GUIDE

Authors: Carol Hufnagel and Chris Catalfio

ACKNOWLEDGMENTS

The Rouge River National Wet Weather Demonstration Project is funded, in part, by the United States Environmental Protection Agency (EPA) Grant #X995743-01, #X995743-02, #X995743-03 and #C995743-01. The views expressed by individual authors are their own and do not necessarily reflect those of EPA. Mention of trade names, products, or services does not convey, and should not be interpreted as conveying, official EPA approval, endorsement, or recommendation.

Rouge River National Wet Weather Demonstration Project

MISSION STATEMENT

The mission of the Rouge River National Wet Weather Demonstration Project is to demonstrate effective solutions to water quality problems facing an urban watershed highly impacted by wet weather and develop potential solutions and implement projects which will lead to the restoration of water quality in the Rouge River. The project will address both conventional and toxic pollutants to:

- provide a safe and healthy recreational river resource for present and future generations;
- re-establish a healthy and diverse ecosystem within the Rouge River Watershed;
- protect downstream water resources such as the Detroit River and Lake Erie; and
- help ensure compliance with federal, state and local environmental laws which protect human health and the environment.

This will be accomplish through the development, implementation and financial integration of technical, social and institutional frameworks leading to cost-efficient and innovative watershed-based solutions to wet weather problems. This watershed-based national demonstration project will provide other municipalities across the nation facing similar problems with guidance and potentially effective solutions.

PREFACE

The Rouge River and its watershed are a primary source of pollution to the Great Lakes. The Clean Water Act of 1972 intended to make waterways "fishable and swimmable" by 1972. Although that goal has not been reached, great progress has been made in improving water quality in most waterways. The Rouge River Remedial Action Plan (RAP) provided a basis for which The Rouge River National Wet Weather Demonstration Project (Rouge Project) efforts were created: it identified the major sources of pollution and measured the relative contributions of each. The RAP is the continuing foundation for the Rouge Project and presents a framework for addressing the problems within the Rouge River by looking beyond treatment and focusing instead on prevention methods.

The Rouge Project was established under the initial Rouge Grant 1 from the United States Environment Protection Agency, Region 5, and enabled Wayne County to initiate a comprehensive watershed-wide pollution-control approach that addresses combined sewer overflow (CSO), stormwater management, and other nonpoint source controls through the application of innovative technologies, progressive financial and institutional arrangements, and creative public involvement and education programs.

Rouge Grant 2 provides the framework for the progression and implementation of Project goals as Wayne County continues its mission to develop potential solutions and implement projects which will lead to the restoration of water quality in the Rouge River. The Project will address both conventional and toxic pollutants to:

- provide a safe and healthy recreational river resource for present and future generations;
- re-establish a healthy and diverse ecosystem within the Rouge River Watershed;
- protect downstream water resources such as the Detroit River and Lake Erie; and
- help ensure compliance with federal, state, and local environmental laws which protect human health and environment.

This will be accomplished through the development, implementation, and financial integration of technical, social, and institutional frameworks leading to cost-efficient and innovative watershed-based solutions to wet weather problems. This watershed-based national demonstration project will provide other municipalities across the nation facing similar problems with guidance and potentially effective solutions.

Under Rouge Grant 2, the Rouge Project will build on lessons learned from Grant 1 efforts and focus on further integration of the goals of the overall Mission. To this end, Rouge Grant 2 concentrates on the following key Project areas:

- •• **Watershed Management** will continue under Rouge Grant 2 with the development and evaluation of wet weather and stormwater alternatives, the planning of long-term monitoring

programs, and the ongoing efforts to enhance instream water quality, monitor rain and flow levels, interpret data analysis, and present recommendations.

- **Nonpoint Source Pollution Control** will provide for the stormwater management, permit applications, and development of financial and institutional alternatives for wet-weather watershed management in concert with enhanced efforts to establish institutional partnerships. Toward the goal of institutional partnering, several community projects will be undertaken with watershed communities. Additional efforts include the inventory of wetlands and measurement of pollutant loads from abandoned dumps and air deposition with possible remediation of some sites.

- **CSO Construction Coordination** will continue to monitor the construction of CSO demonstration projects established under Grant 1. Additional planning and assistance will allow project coordinators to make additional recommendations on the design criteria of future CSO abatement facilities.

- **Public Involvement and Information** will reach and interact with more stakeholders, institutions, and regulatory agencies, thus fostering a renewed understanding and continued commitment to reducing pollution, and continuing the transfer of watershed management approaches way beyond the project. It will be the central mechanism for transmittal of the Project's Decision Support System tools, processes, and information necessary for sustaining a watershed management support system directly to varied audiences both within and outside the Rouge watershed.

Additional information on the Rouge River Project is available from many sources, including the Wayne County Department of Environment (WCDOE) and the Rouge Program Office (RPO).

ABSTRACT

This technical memorandum summarizes procedures for the transfer of CSO basin data. The Rouge Program Office (RPO) has the role of comparing data collected at different CSO control facilities, providing comparative analysis, and providing a repository for basin data collected as part of the community basin evaluation monitoring programs. In order to ensure consistency of data, general guidelines for data transfer are provided in this document. All data received by the RPO will be loaded to the program database. This requires consistency of format in order to ensure that all needed information is provided and that data is correctly recorded in the database.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 BASIN DATA COLLECTION/TRANSFER.

The RPO has identified certain data types to be of greatest value in evaluating basin performance. *Table 1.1* summarizes these data types, which are to be collected at each basin and submitted to the RPO within 60 days of the end of each month monitored. The submitted data will comprise direct measurements, laboratory analyses, and calculated values. Direct measurements will be made either by automatic equipment (for example, flow rates and basin levels) or by operators using field equipment (TRC, dissolved oxygen). Contract labs will provide laboratory analyses. The basin engineer will provide calculated values (for example, influent and effluent pollutant loads).

Table 1.1
Basin Data Collection

Data Type	Locations	Units	Significant Digits	Time Increment
1. Flow/cumulative volume measurement	All; includes influent, effluent, dewatering, decanting, collection system flows, all others monitored.	User specified: Flow: CFS, MGD or GPM. Cumulative volume: MGAL or FT3.	xxxx.xx	Maximum of 15 minutes during events. Daily totals for all dates. Event totals.
2. Basin volume stored	Each compartment and total.	MGAL	xx.xx	Maximum of 15 minutes during events. Instantaneous value at end of each day.
3. Basin levels	Each compartment.	FT	xx.x	Maximum of 15 minutes during events. Instantaneous value at end of each day.
4. Rainfall	At basin or nearest raingage.	IN	xx.xx	15 minutes during events. Peak 15 minute total. Daily totals for all dates. Event totals.
5. Pump operation	Influent, effluent, dewatering, decanting pumps (as applicable) - does not apply to chemical feed pumps, ground-water dewatering or basin flushing pumps.	log start and stop times as mm/dd/ yy hh:mm:ss for each pump at any location	not applicable	Maintain records. Submit paper copies. See Table A.8 in Appendix A for example.

6. Water Quality	Influent, effluent, basin compartments.	Typically MG/L, but depends on analytical method	depends on analytical method	Per monitoring plan.
7.Chlorine Dose Concentration	At each feed point (typically 1 per facility).	MG/L	xxx.x	During events.
8.CBOD, NH3, TSS and Total Phosphorus Load	Influent and effluent.	LB	xxxx.	Daily totals for all dates. Event totals.

Data collected at each basin will be transferred to the RPO monthly within 60 days of the end of each month monitored through four types of reports:

- Time Series Data Reports
- Daily Summary Reports
- Analytical Summary Reports
- Event Summary Reports and Plots

For reporting purposes, a basin event begins when inflow to a basin occurs in response to a rain event. A basin event ends when the basin is completely dewatered, whether or not overflows ever occurred. Two distinctly separate rain events may still be considered part of one basin event if the basin is not completely dewatered between the rain events.

Time Series Data Reports will be submitted for all individual basin events each month (not limited to those that result in overflow to the river) and will typically contain instantaneous flow rate, basin compartment level data, stored volumes, cumulative volumes, 15 minute rainfall totals and chlorine dose concentrations. Daily Summary Reports will be submitted each month and will contain daily totals of basin inflow, overflow, dewatering, and decanting volumes, compartment level data, stored volumes (midnight), total volumes (midnight), total influent and effluent pollutant loads and daily rainfall totals. Analytical Summary Reports will also be submitted each month and will contain laboratory analytical results for all samples collected during that month. Event Summary Reports will be submitted each month and will include event total rainfall, event peak 15-minute rainfall volume, event influent total volume and duration, event effluent total volume and duration and event influent and effluent loads. They will also include paper copies of event summary plots.

Each location from which data will be collected will have a unique Field ID. *Figure 1-1* shows a "typical" basin in schematic view, and identifies nine data collection locations. For example, the "Basin Inflow" location (Field ID: BB01) contains a flow meter and a sample point. Data to be collected from this location will include:

Time Series Data Reports
- instantaneous flow rate measurements
- cumulative volumes

Daily Summary Reports
- total daily inflow volumes
- total daily influent pollutant loads

Analytical Summary Reports
- lab results for discrete (grab or automatic) and composite pollutant samples

Event Summary Reports
- event total volume
- event total duration
- event total pollutant loads
- event plots

As another example, the "Basin Compartment #3" location (Field ID: BB30) has a level sensor and a sample point. Data to be collected from this location will include:

Time Series Data Reports
- instantaneous basin level measurements, during both fill and decant as applicable
- instantaneous stored volumes

Daily Summary Reports
- total volume stored in basin at the end of each day (Midnight)

Analytical Summary Reports
- lab results for discrete (grab or automatic) pollutant samples (possibly at varying depths)

Each monitoring location at each basin will have a 4-character name according to the following general convention: BBSS where BB refers to the basin and SS refers to individual locations for each basin. All data for the facility will need to be identified with the Field ID corresponding to the location at which it was collected. Basin IDs are as follows:

Basin	Character ID
DWSD Hubbell-Southfield	HS
DWSD Seven Mile	SM
DWSD Puritan-Fenkell	PF
Dearborn Heights	DH
Inkster	IN
Redford	RF
Acacia	AC

Bloomfield Village	BV
Birmingham	BR
River Rouge	RR

The SS numbers will refer to individual locations at each basin. While each basin may have a number of locations specific to that basin (for example, overflow weirs between various compartments), the following location IDs are suggested at a minimum, in order to distinguish between different flows and samples:

Location	Numeric ID
Basin Inflow	01
Basin Outflow	02
Basin Dewater	03
Basin Decant	04
Total Volumes	00

Data should be submitted in Excel spreadsheet format or comma-delimited ASCII files. Four separate files should be submitted each month, one for each type of report. If Excel spreadsheets are used, all data within each file must be contained on a single tab. All files submitted should be named using the following naming convention: BBMMYYRR.xls, where BB: basin ID, MM: month, YY: last 2 digits of year, RR: type of report (TS, DS, AS, ES). Subsequent sections of this guide summarize the types of data to be included in each report and provide detailed descriptions of the required formats. Example reports are provided that refer to the Field IDs shown in *Figure 1-1*.

1.1 TIME SERIES DATA REPORTS. *Table 1.2* presents an example of the general format to be used for time series reports. The example includes flow and level data from the "Basin Inflow" and "First Flush Compartment" locations, as shown in *Figure 1-1*. For Excel spreadsheets, each file should have one tab containing rain, level, cumulative volumes, stored volumes, chlorine dose concentrations and flow data. Note that each value is reported on an individual line. The database loading program will read each line individually for storage. A title on the page is not necessary. The spreadsheet should be set-up with the following column headers: FIELD_ID, DATE, TIME, PARAM_ID, UNITS, VALUE, FLAG and FFLAG. Note case, underscore and spacing. Since all parameters are to be included in a single file they should be sorted by parameter (that is, rain, flow, etc.). The locations where flow is monitored will likely include the influent, the effluent, dewatered flow and the decanted flow. Other flow meters may be present. Data should be collected from all locations with flow meters. Despite advances in flow metering technology, the most accurate way to evaluate the fill rates and the total volume stored is by keeping track of the water level in the basin. To assist with level-based volume calculations, basin levels should be recorded to the tenth of a foot and included in each time series report. Level measurements, in feet, are referenced to some arbitrary datum. Depth measurements, in feet, are bottom to surface measurements.

FIGURE 1-1

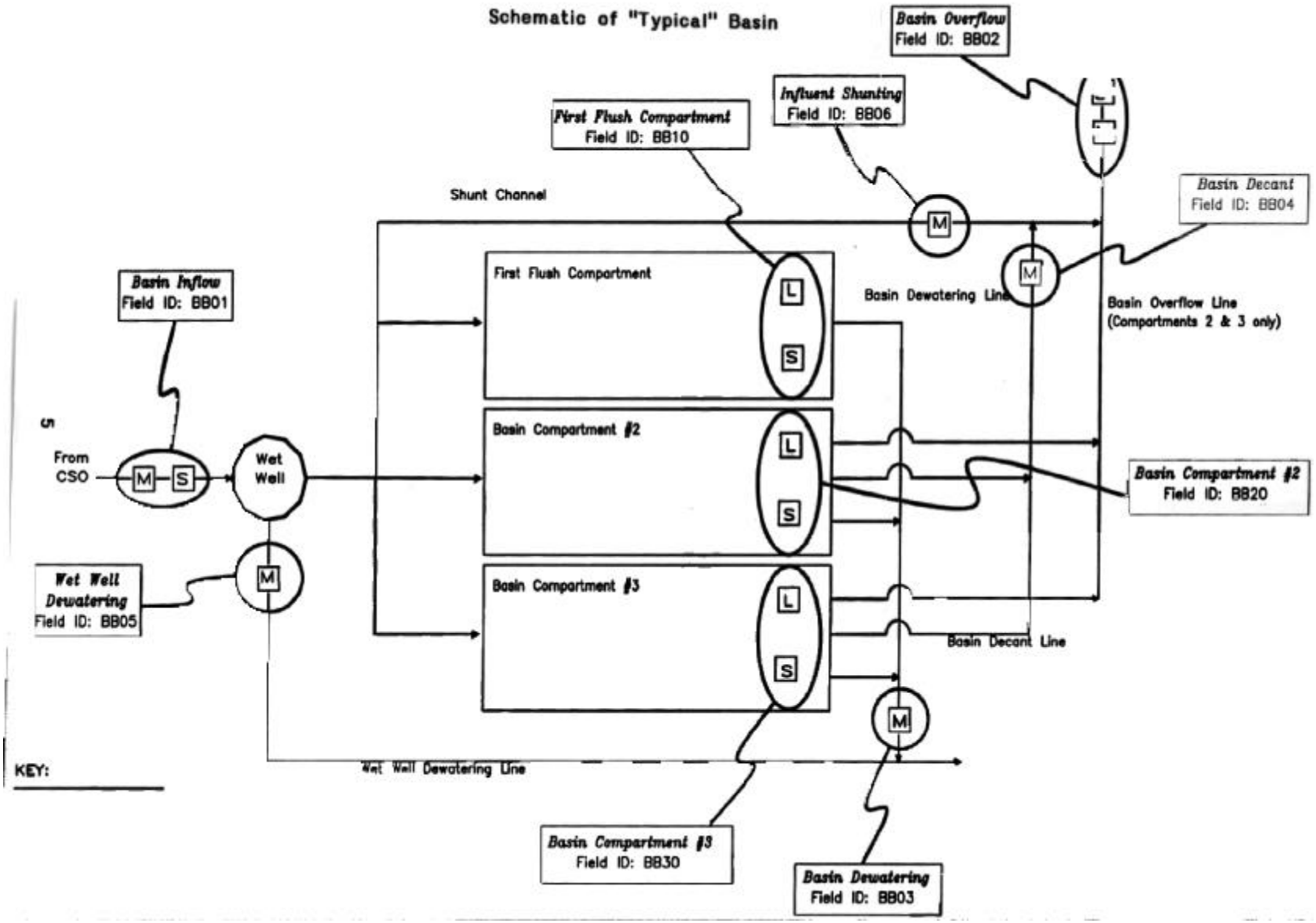

Schematic of "Typical" Basin
Basin Overflow
Field ID: BB02
Influent Shunting
Field ID: BB06
First Flush Compartment
Field ID: BB10
Shunt Channel
Basin Decant
Field ID: BB04
Basin Inflow
Field ID: BB01
First Flush Compartment
Basin Dewatering Line
Basin Overflow Line
(Compartments 2 & 3 only)
From
CSO
Wet
Well
Basin Compartment #2
Basin Compartment #2
Field ID: BB20
Wet Well
Dewatering
Field ID: BB05
Basin Compartment #3
Basin Decant Line
KEY:
Wet Well Dewatering Line
Basin Compartment #3
Field ID: BB30
Basin Dewatering
Field ID: BB03

Table 1.2
Example Time Series Report

FIELD_ID	DATE	TIME	PARAM_ID	UNITS	VALUE	FLAG	FFLAG
BB01	04/01/97	14:45	FLOW	CFS	0	EST	NONE
BB01	04/01/97	15:00	FLOW	CFS	12.2	EST	NONE
BB01	04/01/97	15:15	FLOW	CFS	48.2	EST	NONE
BB01	04/01/97	15:30	FLOW	CFS	63.4	EST	NONE
BB01	04/01/97	15:45	FLOW	CFS	56.2	EST	NONE
BB01	04/01/97	16:00	FLOW	CFS	10.0	EST	NONE
BB01	04/01/97	16:15	FLOW	CFS	0.0	EST	NONE
BB10	04/01/97	14:4	LEVEL	FT	0.0		NONE
BB10	04/01/97	15:00	LEVEL	FT	0.6		NONE
BB10	04/01/97	15:15	LEVEL	FT	3.8		NONE
BB10	04/01/97	15:30	LEVEL	FT	9.6		NONE
BB10	04/01/97	15:45	LEVEL	FT	10.0		NONE
BB10	04/01/97	16:00	LEVEL	FT	10.0		NONE
BB10	04/01/97	16:15	LEVEL	F	10.0		NONE

Standard formats for each item in time series report

1. FIELD_ID: Corresponding facility and location information.

2. DATE: Date when data was collected, month/day/year.

3. TIME: Local time when data was collected (EDT or EST, as appropriate). Times must be reported in military (24-hour) format, hour:minutes.

4. PARAM_ID: Standard data types will include flow, level, stored volume, cumulative volume, chlorine dose concentration and rain. See Table A.1 in Appendix A for time series parameter identification and description.

5. UNITS: User-specified. Types expected include: MGD, GPM, IN, FT, CFS, MGAL, CF, MG/L, etc. Must be appropriate unit for data type. See Table A.1 in Appendix A for units of measurement and description.

6. VALUE:Result should correspond to data described. Results which are known to be erroneous should not be reported. If for whatever reason there is no result, but a reasonable estimate can be made, the estimated value should be entered here and flagged as estimated data in the FLAG field and NONE entered in the FFLAG field. If a reasonable estimate cannot be made, the entire line of data should not be reported (i.e. the result field should never be blank).

7. FLAG: To be used when result requires additional information. Enter appropriate Raw Flag from Table A.5 in Appendix A.

8. FFLAG: This column must have an entry. To be used to accept, flag as questionable or reject data. Enter appropriate Final Flag from Table A.5 in Appendix A.

1.2 DAILY SUMMARY REPORTS. In addition to the time series reporting, daily data will be reported each month in a summary format, similar to discharge monitoring reports that are submitted to the Michigan Department of Environmental Quality (MDEQ). *Table 1.3* provides an example of the desired daily summary report sheet format. In the example, the daily total volume of flow at three locations (inflow, overflow, and dewatering), the daily rain and the daily CBOD load (inflow) is provided. For Excel spreadsheets, each file should have one tab containing daily rain, daily level, daily cumulative volumes, daily stored volumes, daily CBOD load, etc. A title on the page is not necessary. The spreadsheet should be set-up with the following column headers: FIELD_ID, DATE, PARAM_ID, UNITS, VALUE, FLAG and FFLAG. Note case, underscore and spacing. Since all parameters are to be included in a single file they should be sorted by parameter (that is, daily volume, daily rain, daily CBOD load, etc.).

Table 1.3
Example Daily Summary Report

FIELD _ ID	DATE	PARAM _ ID	UNITS	VALUE	FLAG	FFLAG
BB01	04/01/97	DAILY_VOLUME	MGAL	0.53		NONE
BB01	04/02/97	DAILY_VOLUME	MGAL	9.44		NONE
BB01	04/03/97	DAILY_VOLUME	MGAL	6.32		NONE
BB02	04/01/97	DAILY_VOLUME	MGAL	0.0		NONE
BB02	04/02/97	DAILY_VOLUME	MGAL	4.92		NONE
BB02	04/03/97	DAILY_VOLUME	MGAL	1.02		NONE
BB03	04/01/97	DAILY_VOLUME	MGAL	0.53		NONE
BB03	04/02/97	DAILY_VOLUME	MGAL	9.44		NONE
BB03	04/03/97	DAILY_VOLUME	MGAL	6.32		NONE
BB83	04/01/97	DAILY_RAIN	IN	0.31		NONE
BB83	04/02/97	DAILY_RAIN	IN	1.32		NONE
BB83	04/03/97	DAILY_RAIN	IN	1.40		NONE
BB01	04/01/97	DAILY_CBOD_LOAD	LB	225		NONE
BB01	04/02/97	DAILY_CBOD_LOAD	LB	2200		NONE
BB01	04/03/97	DAILY_CBOD_LOAD	LB	860		NONE

Standard formats for each item in daily summary report

1. **FIELD_ID**: Corresponding facility and location information.

2. **DATE**: Date when data was collected, month/day/year. Note: all total flow volumes, rainfall volumes, etc. are to be summed from midnight to midnight.

3. **PARAM_ID**: Standard data types will include daily cumulative volumes, daily levels, daily stored volumes, daily rain and daily loads. See Table A.2 in Appendix A for daily summary parameter identification and description.

4. **UNITS**: User-specified. Types expected include: MGAL, IN, FT, LB. Must be appropriate unit for data type. See Table A.2 in Appendix A for units of measurement and description.

5. **VALUE**: Result should correspond to data described. Results which are known to be erroneous should not be reported. If for whatever reason there is no result, but a reasonable estimate can be made, the estimated value should be entered here and flagged as estimated data in the FLAG field and NONE entered in the FFLAG field. If a reasonable estimate cannot be made, the entire line of data should not be reported (i.e. the result field should never be blank).

6. **FLAG**: To be used when result requires additional information. Enter appropriate Raw Flag from Table A.5 in Appendix A.

7. **FFLAG**: This column must have an entry. To be used to accept, flag as questionable or reject data. Enter appropriate Final Flag from Table A.5 in Appendix A.

1.3 ANALYTICAL SUMMARY REPORTS. Analytical results include both laboratory and on-site measurements (such as dissolved oxygen, TRC, etc.). *Table 1.4* summarizes the general information to be reported regarding water quality measurements and analysis:

Table 1.4
Summary of Analytical Reporting Requirements

Type of Information	Remarks
Date and time of sample collection	Start and stop time associated with the sample. For discrete samples enter the time of sample collection. For composite samples start time will be the time the first sample was collected and stop time will be the time the last sample was collected.
Location of sample collection	Site identifier for each sample collection point

Sample identification number	Standard RPO sample identification format
Sample results	Laboratory/field measurement results
Sample qualifiers (flags)	Includes BDL (below detection limit) and other flags
Analytical technique/detection limits	Identifies laboratory method used and laboratory detection limits

Table 1.5 presents a sample Analytical Results spreadsheet format. A title on the page is not necessary. The standard formats for the items are discussed below. Note case, underscore and spacing.

Table 1.5
Example Analytical Summary Report

FIELD_ID	COLL_DATE1	COLL_TIME1	COLL_DATE2	COLL_TIME2	SAM_TYPE	SAMPLE_ID	PARAM_ID	V	RESULT	UNITS	FLAG1	FLAG2	FFLAG	MDL	MDL_UNITS	METHOD	LAB	SAM_LEVEL	LEVEL_UNITS
BB01	04/01/97	14:45			AUTO	BB01704011445A01	CBOD5		2.3	MG/L			NONE	2	MG\L	405.1	HVL		
BB01	04/01/97	14:45	04/01/97	16:45	EC	BB01704011445EC1	CBOD5		2.6	MG/L			NONE	2	MG\L	405.1	HVL		
BB01	04/01/97	14:45			AUTO	BB01704011445A01	TSS		14	MG/L			NONE	1	MG\L	160.2	HVL		
BBO2	04/01/97	15:45			AUTO	BB02704011545A01	CBOD5	<	2.0	MG/L	BDL	HT	NONE	2	MG\L	405.1	HVL		
BB21	04/01/97	18:45			DECANT	BB21704011845D01	CBOD5		5.0	MG/L			NONE	2	MG\L	405.1	HVL	5.0	FT

Standard formats for each item in analytical spreadsheet

1. FIELD_ID: Corresponding facility and location information.
2. COLL_DATE1: Start date when data was collected, month/day/year.
3. COLL_TIME1: Local start time when data was collected (EDT or EST, as appropriate). Times must be reported in military (24-hour) format, hour:minutes.
4. COLL_DATE2: For composite samples only; leave blank for discrete samples. Stop date when data was collected, month/day/year.
5. COLL_TIME2: For composite samples only; leave blank for discrete samples. Local stop time when data was collected (EDT or EST, as appropriate). Times must be reported in military (24-hour) format, hour:minutes.
6. SAM_TYPE: Discrete samples either GRAB or AUTO. Composite samples EC. For quality assurance samples, special composites and decant samples refer to Table A.4 in Appendix A.
7. SAMPLE_ID: 16 characters: BBSSYMMDDHHmmT##. BB: basin ID, SS: monitoring location, Y: last digit of year, MM: month, DD: day, HH: hour, mm: minute (date/ time is start sample time), T: type (G-grab, A-automatic, EC-composite,), ##: serial number for consecutive samples from a given location. For quality assurance samples, special composites and decant samples refer to Table A.4 in Appendix A for the appropriate T## designation.
8. PARAM_ID: Standard RPO abbreviation for parameter being analyzed. See Table A.3 in Appendix A for a list of standard abbreviations.
9. V: If a “<“ or “>”is required, show in this column. Include value indicator flag description in FLAG1 column. See Table A.5 in Appendix A.
10. RESULT: Numerical result. Results which are known to be erroneous should still be reported and assigned a FFLAG of “R”, for rejected. If no analyses were performed or no result was obtained, retain for your records, but do not include in report.
11. UNITS: Units of measurement for a particular parameter. See Table A.3 in Appendix A for a list of units of measurement.
12. FLAG1: Use for any laboratory or field flags (such as HT - holding time, or BDL - below detection limit). Use FLAG1 first and then FLAG2 if a second flag applies. Select appropriate Raw Data flag from Table A.5 in Appendix A.
13 FLAG2: If a second laboratory or field flag is required complete this column. Select appropriate Raw Data flag from Table A.5 in Appendix A.
14. FFLAG: This column must have an entry. To be used to accept, flag as questionable or reject data. Select appropriate Final Flag from Table A.5 in Appendix A.
15. MDL: Detection limit of laboratory or field methodology.
16. MDL_UNITS: Units of method detection limit. See Table A.3 in Appendix A for a list of units of measurement and descriptions.
17. METHOD: Reference to EPA or Standard Method (SM) numbers. Identify one method per parameter. Do not include both the EPA and SM numbers. See Table A.3 in Appendix A for a list of available methods and descriptions.
18. LAB: Identification of laboratory or organization performing analyses. For analyses performed at basin use basin identification as laboratory. See Table A.6 in Appendix A for a list of available organizations and laboratories and descriptions. If using an organization or laboratory not listed in Table A.6, select an appropriate abbreviation and use it consistently.
19. SAM_LEVEL: Referenced to the same datum as the reported compartment water level data. Basins will, on occasion, be required to sample for water quality at various levels in the basin. This field will be used to record the water level at which each sample was collected. This column requires completion when decant samples are collected.
20. LEVEL_UNITS: Units of level measurement (FT) for levels reported in SAM_LEVEL field.

1.4 EVENT SUMMARY REPORTS AND PLOTS. At times it is necessary to generate event reports based on the time series data. Therefore, an event summary report and plot is needed for every event. *Table 1.6* provides an example of the desired event summary report sheet format. An example of the event summary plot format is included in Appendix B.

1.4.1 Event Summary Report. For the event summary report submit one file with one tab for event total rain, event peak 15-minute rain volume, event cumulative volumes, event loads and event duration. A title on the page is not necessary. The spreadsheet should be set-up with the following column headers: FIELD_ID, DATE1, TIME1, DATE2, TIME2, PARAM_ID, UNITS, VALUE, FLAG, FFLAG AND EVENT_NUM. Note case, underscore and spacing. Since all parameters are to be included in a single file they should be sorted by parameter (that is, event volume, event rain, event duration, etc.).

Table 1.6
Example Event Summary Report

FIELD_ID	DATE1	TIME1	DATE2	TIME2	PARAM_ID	UNITS	VALUE	FLAG	FFLAG	EVENT _NUM
BB82	07/07/98	14:55	07/08/98	18:00	EVENT_RAIN	IN	0.43	CAL	NONE	
BB82	07/07/98	14:55	07/08/98	18:00	EVENT_15MINPEAK	IN	1.12	CAL	NONE	
BB01	07/07/98	14:55	07/08/98	18:00	EVENT_VOLUME	MGAL	7.20	CAL	NONE	
BB02	07/07/98	14:55	07/08/98	18:00	EVENT_VOLUME	MGAL	4.00	CAL	NONE	
BB01	07/07/98	14:55	07/08/98	18:00	EVENT_DURATION	HH:MM	20:45	CAL	NONE	
BB02	07/07/98	14:55	07/08/98	18:00	EVENT_DURATION	HH:MM	13:00	CAL	NONE	
BB01	07/07/98	14:55	07/08/98	18:00	EVENT_TSS_LOAD	LB	1205	CAL	NONE	
BB02	07/07/98	14:55	07/08/98	18:00	EVENT_TSS_LOAD	LB	216	CAL	NONE	

The date/time fields in the Event Summary Report are intended to reflect a date/time range which fully encompasses the date/time of all data values included in the Time Series Data Report for the same event.

In addition to the electronic report submitted, paper copies of the Event Summary Plots are needed. These should be submitted with the monthly reports and should include plots of the event; rainfall, flow hydrograph, CBOD5 concentration, TSS concentration, total phosphorus concentration, ammonia concentration, fecal coliform concentration, TRC concentration and NaOCl dose concentration, dissolved oxygen and temperature and pH.

Standard formats for each item in event summary spreadsheet

1. **FIELD_ID**: Corresponding facility and location information.

2. **DATE1**: Start date of the values reported in the Time Series Data Report, month/day/year.

3. **TIME1**: Local time associated with the earliest value reported in the Time Series Data Report (EDT or EST, as appropriate). Times must be reported in military (24-hour) format, hour:minutes.

4. **DATE2**: End date of values reported in the Time Series Data Report, month/day/year.

5. **TIME2**: Local time associated with the latest value reported in the Time Series Data Report (EDT or EST, as appropriate). Times must be reported in military (24-hour) format, hour:minutes.

6. **PARAM_ID**: Standard data types will include event rain, event 15-minute peak volume, event volume, event pollutant loads and event duration. See Table A.7 in Appendix A for event parameter identification and description.

7. **UNITS**: User-specified. Types expected include: IN, MGAL, HH:MM and LB. Must be appropriate unit for data type. See Table A.7 in Appendix A for units of measurement and description.

8. **VALUE**: Result should correspond to data described. Results which are known to be erroneous should not be reported. If for whatever reason there is no measured or calculated result, a reasonable estimate should be entered here, flagged as estimated data in the FLAG field and NONE in the FFLAG field.

9. **FLAG**: To be used when result requires additional information. Enter appropriate Raw Flag from Table A.5 in Appendix A.

10. **FFLAG**: This column must have an entry. To be used to accept, flag as questionable or reject data. Enter appropriate Final Flag from Table A.5 in Appendix A.

11. **EVENT_NUM**: Leave blank, the RPO will assign this number. This number will be assigned to give each event unique identification.

1.4.2 Event Summary Table, Plots and Tabular Summary. Event Summary Tables, Plots and Tabular Summaries are to be prepared for each event where basin inflow occurred in response to a rain event, regardless of how complete the sampling results are for the event. The specific table, plot and tabular summary format is shown in an example in Appendix B. Each page of the table, plots and tabular summary for each event should have the same header that clearly indicates the name of the facility and the date of the event. A standard template per

the example should be used consistently, even if certain graphs on a page contain no data. In general the standard template should include the following, but the standard template may need to be modified or expanded to accommodate the results of any special sampling.

Page B - 1: Summary Table
Page B - 2: Plots of Rainfall; Flow; CBOD5 (or BOD5) along with UBOD; and TSS
Page B - 3: Plots of NH3, Total Phosphorous; Fecal Coliform; and TRC along with Estimated Chlorine Dose Concentration
Page B - 4: Plots of DO; Temperature; pH; Oil & Grease; Chlorides and any other parameters for which discrete sampling was performed.
Page B - 5: Tabular Summary

Standard formats for each item in summary table (page B - 1)

1. **Above Table**: Indicate the basin size (million gallons) and the combined sewer drainage area tributary to the basin (acres). Indicate the event total rainfall (inches) and the Field ID of the gage the totals are based on. These values should be identical to what is provided in the Event Summary Report.

2. **Flow**: Indicate the influent and effluent volume (million gallons, and inches over the drainage area in parenthesis) and duration (hours:minutes in military format). These values should be identical to what is provided in the Event Summary Table.

3. **Discrete Water Quality**: Indicate the parameters for which discrete influent and/or effluent samples/measurements were taken. Indicate the number of readings for each parameter.

4. **Composite Water Quality**: Indicate all parameters for which composite samples were analyzed, along with the result and units for each sample.

5. **Visual Observations**: Describe any visual observations of the basin effluent.

6. **Special Monitoring**: Describe any special monitoring performed such as sampling at the decant, swirl, intermediate weir, or at various depths within the basin. Identify the parameters analyzed and the number of samples per location. The summary table and discrete water quality plots should also be modified as appropriate to clearly communicate these results in a similar fashion as the influent and effluent data. For example, decant flow and sampling data could be added as a third symbol to all the appropriate plots, and a second page could be added to the summary table with the two columns labeled “Influent” and Effluent” replaced by a single column labeled “Decant.”

7. **Operational Notes**: Specify the basin operating mode as first-flush capture or flow-through. Also describe any operational, equipment or monitoring problems which occurred during the event that could aid in interpreting the monitoring results.

Standard formats for each item in plots (pages B-2 through B-4)

1. **General**: Clearly label the title and legend of each plot. Label each axis with the parameter followed by the units in parenthesis. Abbreviations for units should be consistent with those used in the various reports described earlier in this document. The horizontal axis of each plot should reflect military time. Select minimum and maximum values of vertical axis appropriately so data make use of much of the vertical range on the plots.

2. **Rainfall**: Bar chart should reflect 15 minute rainfall totals.

3. **CSO Flow Hydrograph**: Plot measured, computed or estimated influent and effluent flow hydrographs using two distinctly different line weights/types.

4. **All Other Parameters**: Plot all water quality sample or field measurement results using distinctly different symbols for each sampling location. For values which are above or below a detection limit, plot the values as equal to the detection limit. Do not plot lines between data points.

Standard formats for tabular summary (pages B - 5 through B - 7)

1. **General**: The tabular summary should include all of the analytical data from the event. The tabular data should be sorted by parameter, location, date and time.

2. **Parameter**: Identification should be consistent with identification in the analytical summary, refer to Table A.3 in Appendix A.

3. **Sample Location**: Location description; influent, effluent, decant, swirl, intermediate weir, etc.

4. **Sample Type**: Enter auto, grab or composite.

5. **Date**: Date of values reported, month/day/year.

6. **Time**: Time of values reported in military format, hour:minutes.

7. **Value**: Value to be reported.

8. **Units**: Units of value reported, refer to Table A.3 in Appendix A.

9. **Detection Limit**: Detection limit of laboratory or field methodology.

10. **Method Detection Limit Units**: Units of method detection limit, refer to Table A.3 in Appendix A.

11. **Method**: EPA or Standard Method number, refer to Table A.3 in Appendix A.

12. **Final Flag**: Final Flag should correspond to the final flag used in the analytical summary report, refer to Table A.5 in Appendix A.

2.0 BASIN DATA ANALYSIS.

Certain basin operating parameters to be reported in the Daily Summary Reports, Analytical Summary Reports and Event Summary Reports will have to be calculated by the basin engineer. Examples include influent and effluent pollutant loads, the volume of water remaining in basin compartments at the end of each day, composite sample flow volumes and the duration of events. While the calculations will be straightforward, it is important that they be performed in a consistent manner from basin to basin, so that results can be compared directly. The following sections describe how the calculations should be made.

2.1 BASIN STORED VOLUME.

The volume of water in a basin compartment is simply the water level, as provided by the level sensor, multiplied by the area of the basin floor. The actual area of each basin compartment should be verified from as-built construction drawings and, if possible, included in the header of the Daily Summary Reports. The basin level reading used for Basin Stored Volume calculations should be taken at midnight, corresponding to the previous day. That is, the basin level at one minute after 02/14/97 23:59 will be used to calculate the volume stored for 02/14/97. The person responsible for the calculations should retain all spreadsheets and/or hand calculations for the duration of the basin evaluation study.

2.2 DAILY POLLUTANT LOADS.

The collection of flow-paced composite samples of basin inflow and overflow simplifies the calculation of total pollutant loading. As each fractional volume of the composite sample represents an equal volume of flow, the resulting composite amounts to a flow-weighted average concentration, and the total load can be calculated as follows:

$$Wi = Q*Ci*8.34$$

where

Wi = Total load of ith pollutant, LB
Q = Total volume of flow, MGAL
Ci = Concentration of ith pollutant in flow-paced composite sample, MG/L

Total pollutant loads can also be calculated from discrete sample results and time series flow data. There are several approaches that can be taken; the following approach makes use of all the flow data and produces reasonably accurate results.

The first step involves calculation of cumulative total flow as shown in *Table 2.1*. The integration formula in Column C should be copied down to the end of the time series flow data. The resulting values represent the cumulative flow at each time in Column A.

Table 2.1
Spreadsheet Calculation of Cumulative Volume

	A	B	C
1	Time HH:MM	Flow CFS	Cumulative Volume MGAL
2	18:35	0	
3	18:40	0.51	=((B2+B3)/2*(A3-A2)*60*7.48/1000000)+C2
4	18:45	2.83	
5	18:50	4.41	
6	18:55	3.13	
7	19:00	3.29	
8	19:05	3.16	
9	19:10	3.19	
10	19:15	2.85	
11	19:20	1.21	
12	19:25	1.01	
●	●	●	●
●	●	●	●
25	20:30	0	

The second step involves matching cumulative flow volumes with the discrete samples taken at corresponding times. In the case where sample collection times do not exactly match flow measurement times, the required cumulative volume is calculated from a linear interpolation formula as shown in *Table 2.2* below.

Table 2.2
Linear Interpolation of Cumulative Volume

	A	B	C
1	Time HH:MM	Flow CFS	Cumulative Volume MGAL
2	18:35	0	
3	18:40	0.51	0.000572
4	18:45	2.83	0.00432
5	18:50	4.41	0.012443
6	18:55	3.13	0.020903
7	19:00	3.29	0.028106
8	19:02	=(B9-B7)/(A9-A7)*(A8-A7)	=((B7+B8)/2*(A8-A7)*60*7.48/1000000)+C7
9	19:05	3.16	0.035343
10	19:10	3.19	0.042468
●	●	●	●
●	●	●	●
25	20:25	0.05	0.105255
26	20:30	0	0.105311

The final step involves calculating the cumulative loading from the discrete sample results and corresponding cumulative flow volumes, as shown in *Table 2.3* below. Note that the formula in D2 is different from that in D3. The formula in D3 should be copied down for each pair of concentration and cumulative flow data; the value in the last cell represents the total load for the event (which in this example comes out to 93.2 lb.). If the cumulative volume continues beyond the last sample collected and at least 80 percent of the volume was sampled then use the last concentration measurement in determining cumulative load. If 80 percent of the volume was not sampled then flag the results describing that the sampling was incomplete.

Table 2.3
Spreadsheet Calculation of Cumulative Pollutant Load

	A	B	C	D
1	Time HH:MM	Cumulative Flow (MGAL)	Concentration (MG/L)	Cumulative Load (LB)
2	18:45	0.00432	152	=C2*B2*8.34
3	19:02	0.031001	148	=(C2+C3)/2*(B3-B2)*8.34+D2
4	19:15	0.049245	120	
5	19:30	0.074849	65	
6	20:00	0.101878	50	
7	20:30	0.105311	37	

While this method is time-consuming, it does provide a graphical representation of the change in pollutant loading rate over time. For simplicity's sake, however, total daily pollutant loads should be calculated from flow-paced composite samples whenever possible.

APPENDIX A

Table A.1
Time Series Data Report
Data Parameters and Units

PARAM_ID	PARAM_ID DESCRIPTION	UNITS	UNITS DESCRIPTION
15_MIN_RAIN	15 minute rainfall totals	IN	Inches
LEVEL	Instantaneous water level referred to arbitrary datum in each compartment	FT	Feet
FLOW	Instantaneous flow measurement	MGD,CFS,GPM	Million Gallons per Day, Cubic Feet per Second, Gallons per Minute
STORED_VOLUME	Volume of water stored at a given time	MGAL,FT3	Millions Gallons, Cubic Feet
CUM_VOLUME	Totaalvolume of water which has flowed past a given location since the start of an event	MGAL,FT3	Million Gallons, Cubic Feet
CL_DOSE_CONC	Chlorine concentration just past the point of injection assuming instantaneous mixing.	MG/L	Milligrams per Liter

Table A.2
Daily Summary Report
Data Parameters and Units

PARAM_ID	PARAM_ID DESCRIPTION	UNITS	UNITS DESCRIPTION
DAILY_RAIN	Daily rainfall total	IN	Inches
DAILY_LEVEL	Instantaneous water level referred to arbitrary datum in each compartment at end of reporting day (midnighta0	FT	Feet
DAILY_CUM_VOLUME	Total volume of water which had flowed past a given location within the given calendar day.	MGAL	Million Gallons
DAILY_STORED_VOL	Volume stored in each basin compartment and total stored volume at end of reporting day (midnight). To be calculated from basin level.	MGAL	Millon Gallons
DAILY_CBOD_LOAD DAILY_TSS_LOAD DAILY_NH3_LOAD DAILY_TOTAL_PHOS_LOAD	Total pollutant load which has flowed past a given location within the given calendar day. For influent and effluent locations only. To be calculated from flow based composite or discrete sample concentrations and cumulative flows.	LB	Pounds

Table A.3
Analytical Summary Report
Data Parameters, Units and Method Identification

				EPA METHOD		OTHER METHODS	
PARAM_ID	**PARAM_ID DESCRIPTION**	**UNITS**	**UNITS DESCRIPTION**	**METHOD**	**METHOD DESCRIPTION**	**METHOD**	**METHOD DESCRIPTION**
ALK	Alkalinity (as CaCO3)	MG/L	Milligrams per Liter	310.1	EPA Standard Method for Alkalinity	2320	Standard Method for Alkalinity
BOD5	5-Day Biochemical Oxygen Demand	MG/L	Milligrams per Liter	405.1	EPA Standard Method for BOD	SM5210B	Standard Method for BOD5
CBOD5	5-Day Carbonaceous BOD	MG/L	Milligrams per Liter	405.1	EPA Standard Method for CBOD		
Cl	Chloride	MG/L	Milligrams per Liter	325.3	EPA Standard Method for Chloride		
COD	Chemical Oxygen Demand	MG/L	Milligrams per Liter	410.4	EPA Standard Method for Chemical Oxygen Demand		
COND	Conductivity	mS/cm	Microsiemans per centimeter	120.1	EPA Standard Method for Conductivity		
DO	Dissolved Oxygen	MG/L	Milligrams per Liter			WINKLER YSISOLO	Winkler Dissolved Oxygen YSI or Solomat Dissolved Oxygen Sensor
F_COLI	Fecal Coliform	#/100 ML	Number per 100 milliliters			9222D or SM9222D	Standard Method for Fecal Coliform
FRC	Free Residual Chlorine	MG/L	Milligrams per Liter			HACHLAM	HACH or LaMotte Test Kits
HARD	Hardness (as CaCO3)	MG/L	Milligrams per Liter	130.2	EPA Standard Method for Hardness		
NH3	Ammonia	MG/L	Milligrams per Liter	350.1 or 350.2 or 350.3	EPA Standard Method for NH3		
OIL_GRS	Oil and Grease	MG/L	Milligrams per Liter	413.1	EPA Standard Method for Oil and Grease		
PHOS_T	Total Phosphorus	MG/L	Milligrams per Liter	365.2 or 365.3 or 365.4	EPA Standard Method for Total Phosphorus		
pH	pH	SU	Standard Units	150.1	EPA Standard Method for pH		
SBOD	Soluble Fraction BOD5	MG/L	Milligrams per Liter	405.1	EPA Standard Method for SBOD		
SCBOD	Soluble Fraction CBOD5	MG/L	Milligrams per Liter	405.1	EPA Standard Method for SCBOD		
WTRTEMP	Water Temperature	C	Degrees Celsius			SM2550B	Standard Method for Water Temperature
TOC	Total Organic Carbon	MG/L	Milligrams per Liter	415.1	EPA Standard Method for Total Organic Carbon		
TRC	Total Residual Chorine	MG/L	Milligrams per Liter			HACHLAM	HACH or LaMotte Test Kits
TSS	Total Suspended Solids	MG/L	Milligrams per Liter	160.2	EPA Standard Method for Total Suspended Solids		
UBOD	Ultimate BOD	MG/L	Milligrams per Liter			SM5210C	Standard Method for UBOD
UCBOD	Ultimate CBOD	MG/L	Milligrams per Liter			SM5210C	Standard Method for UCBOD
AS_D	Dissolved Arsenic	MG/L	Milligrams per Liter	206.2	EPA Standard Method for Dissolved Arsenic		
CD_D	Dissolved Cadmium	MG/L	Milligrams per Liter	213.2	EPA Standard Method for Dissolved Cadmium		
CR_D	Dissolved Chromium	MG/L	Milligrams per Liter	218.2	EPA Standard Method for Dissolved Chromium		
CU_D	Dissolved Copper	MG/L	Milligrams per Liter	220.2	EPA Standard Method for Dissolved Copper		
HG_D	Dissolved Mercury	MG/L	Milligrams per Liter	245.1	EPA Standard Method for Dissolved Mercury		

PB_D	Dissolved Lead	MG/L	Milligrams per Liter	239.2	EPA Standard Method for Dissolved Lead		
NI_D	Dissolved Nickel	MG/L	Milligrams per Liter	249.2	EPA Standard Method for Dissolved Nickel		
ZN_D	Dissolved Zinc	MG/L	Milligrams per Liter	289.2	EPA Standard Method for Dissolved Zinc		
AS_T	Total Arsenic	MG/L	Milligrams per Liter	206.2	EPA Standard Method for Totall Arsenic		
CD_T	Total Cadmium	MG/L	Milligrams per Liter	213.2	EPA Standard Method for Total Cadmium		
CR_T	Total Chromium	MG/L	Milligrams per Liter	218.2	EPA Standard Method for Total Chromium		
CU_T	Total Copper	MG/L	Milligrams per Liter	220.2	EPA Standard Method for Total Copper		
HG_T	Total Mercury	MG/L	Milligrams per Liter	245.1	EPA Standard Method for Total Mercury		
PB_T	Total Lead	MG/L	Milligrams per Liter	239.2	EPA Standard Method for Total Lead		
NI_T	Total Nickel	MG/L	Milligrams per Liter	249.2	EPA Standard Method for Total Nickel		
ZN_T	Total Zinc	MG/L	Milligrams per Liter	289.2	EPA Standard Method for Total Zinc		

Table A.4
Data Sample Types and Sample Identification Type and Number

		SAMPLE_ID (BBSSYMMDDHHmmT##)
SAM_TYP	**DESCRIPTION**	**T##**
GRAB	Discrete Grab Sample	G##
AUTO	Discrete Automatic Sample	A##
EC	Event Composite Sample	EC#
QCFD	Field Duplicate QC Sample	A81 or G81, Auto or Grab respectively
QCMS	Matrix Spike QC Sample	A82 or G82, Auto or Grab respectively
QCMSD	Matrix Spike Duplicate QC Sample	A83 or G83, Auto or Grab respectively
QCABB	Automatic Bottle Blank QC Sample	A84 or G84, Auto or Grab respectively
QCTB	Trip Blank QC Sample	A85 or G85, Auto or Grab respectively
QCFB	Field Blank QC Sample	A86 or G86, Auto or Grab respectively
QCSS	Split Sample QC Sample	A87 or G87, Auto or Grab respectively
QCMB	Method Blank QC Sample	A88 or G88, Auto or Grab respectively
EP	Event Partial Sample (incomplete event coverage)	EP#

Table A.5
Raw and Final Data Flags

RAW FLAGS

FLAG	DESCRIPTION
ND	Non-detect
BDL	Below detectable limits - less than the method lower detection limit
NSQ	Not sufficient quantity
LAC	Laboratory accident
ISP	Improper sample preservation
MI	Matrix interference
HT	Holding time (exceeded)
CAL	Calculated result
EST	Estimated value
CAN	Cancelled
FAC	Field accident
LTL	Less than lower detection limit - less than the lowest dilution prepared
GTL	Greater than upper detection limit - greater than the highest dilution prepared
GDL	Greater than detection limit - greater than the method upper detection limit

FINAL FLAGS

FLAG	DESCRIPTION
NONE	No flag
J	Questionable, problem but not severe enough to reject
R	Rejected
NDJ	Questionable plus estimated not detect
P	Failed logical check
NR	Not reliable

Table A.6
Organizations and Laboratories

LAB	DESCRIPTION
AC	Acacia Basin
A&B	AB
AAC	AAC Trinity
ASCI	ASCI
BAI	Brighton Analytical, Inc.
BR	Birmingham Basin
BV	Bloomfield Village Basin
CAL	Canton Analytical Laboratory
CDM/RPO	Camp Dresser and McKee
DH	Dearborn Heights Basin
EAGLE	EAGLE
ENC	Encotec
ENSR	ENSR
ERG	Environmental Research Group, Inc.
HRC	Hubbell, Roth and Clark
HS	Hubbell-Southfield Basin
HVL	Huron Valley Laboratory
IN	Inkster Basin
KEMRON	Kemron
MEG	Matrix Environmental Group, Inc.
MPS	McNamee, Porter & Seeley, Inc.
PF	Puritan-Fenkell Basin
RF	Redford Basin
RR	River Rouge Basin
SEL	SEL
SM	Seven Mile Basin
UNKNOWN	Unknown Lab
UOFM	UM_SPH
WCDPW	Wayne County Division of Public Works
WLN	Walled Lake - Novi Treatment Plant Laboratory

Table A.7
Event Summary Report
Data Parameters and Units

PARAM_ID	PARAM_ID DESCRIPTION	UNITS	UNITS DESCRIPTION
EVENT_RAIN	Event total rainfall volume determined by basin operator / engineer to be associated with the event	IN	Inches
EVENT_15MINPEAK	Event rainfall 15 minute peak volume	IN	Inches
EVENT_VOLUME	Total volume of water which has flowed past a given location for a specific event	MGAL	Million Gallons
EVENT_DURATION	Total duration of period(s) when flow occurred at a given location during a given event. For influent and effluent locations only. (Example: if basin inflow occurred for 3 hours, then stopped for several hours, and then inflow occurred for 2 more hours, the reported inflow duration would be 05:00.)	HH:MM	Hours:Minutes
EVENT_CBOD_LOAD	Total pollutant load which has flowed past a given location for a given event. Influent and effluent locations only.	LB	Pounds
EVENT_TSS_LOAD			
EVENT_NH3_LOAD			
EVENT_TOTAL_PHOS_LOAD			

Table A.8
Sample Pump Operation Log

Redford CSO Basin				
Dewatering Pump Operation Log*				
March 1998				
PUMP NO.	ACTION	DATE	TIME	
3	START	3/12/98	14:55	
2	START	3/12/98	15:30	
2	STOP	3/13/98	0:25	
4	START	3/13/98	0:30	
4	STOP	3/13/98	1:30	
3	STOP	3/13/98	2:00	

*To be supplied for influent, effluent, dewatering and decanting pumps as applicable.

APPENDIX B